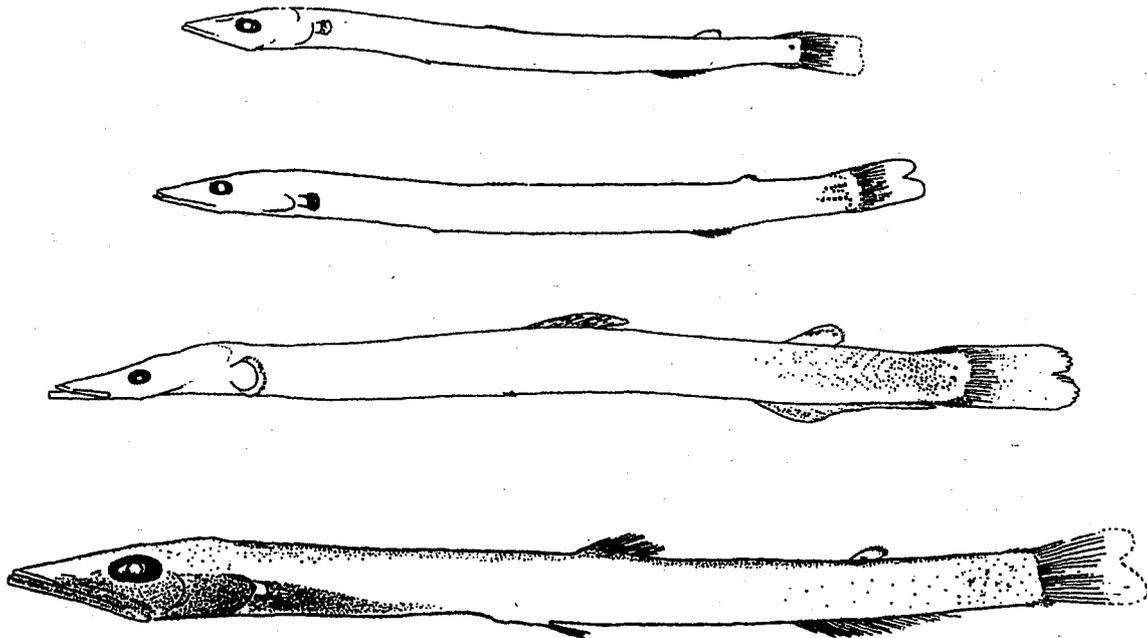




PRELIMINARY GUIDE TO THE IDENTIFICATION OF THE EARLY LIFE HISTORY STAGES OF
NOTOSUDID FISHES OF THE WESTERN CENTRAL ATLANTIC

BY

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This report should be cited as follows:

Richards, W. J. 1999. Preliminary guide to the identification of the early life history stages of notosudid fishes of the western central Atlantic. NOAA Technical Memorandum NMFS-SEFSC-421, 11 p.

The author thanks S. Kelley, S. Bolden, and B. Brandt for technical support; and Dr. L. Massey for editorial support.

This report will be posted on the SEFSC web site later in 1999 at URL: www.sefsc.noaa.gov

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The Family Notosudidae, formerly called Scopelosauridae, is a small family of oceanic fishes that was reviewed in depth by Bertelsen et al. (1976). Five species occur in our area (4 *Scopelosaurus* and 1 *Ahliesaurus*) of this aulopiiform family that resemble moderately elongated paralepidids. They lack photophores, all fin rays are soft with the dorsal fin with 9-14 rays, pelvic fins almost always 9, anal fin with 16-21 rays, pectoral rays 10-15, caudal fin with 19 principal rays (17 branched), and an adipose fin present. Adults are synchronous hermaphrodites. Planktonic eggs have not been identified and yolk sac larvae are rare. The larvae are very distinct with little variation among species and they transform around 30 mmSL. The larval body is long and slender,

subcylindrical in shape with the caudal region compressed. Snout is long & wedge-shaped. Body depth is about 6% of SL. The eyes are narrow with a posteriorly prolonged conical mass of choroid tissue. They are slightly stalked in young larvae and during development they become broader approaching a pear-shape until they are horizontal as the stalks are lost. Pectoral fins develop first followed by caudal, anal, and adipose with the dorsal and pelvics developing relatively late being rarely visible in specimens less than 20mmSL. Pigmentation is restricted to the tail region and is diagnostic. The following key to the larvae is adapted from Bertelsen et al. (1976). Information on California Current representatives is provided by Watson & Sandknop (1996).

Key to Larval Notosudids

- 1a. Pigment on tail (caudal peduncle and/or caudal fin) 2
- 1b. No pigment on tail..... *Scopelosaurus argenteus* (between 10-14mm and 18-29mmSL)
- 2a. Broad band of numerous small melanophores on caudal peduncle..... 3
- 2b. Pigment on caudal peduncle, if present, consisting of or dominated by few larger melanophores..... 4
- 3a. A single series of about 6 large internal melanophores under the vertebral column, and pigment on anal fin, no series of enlarged melanophores along base of caudal fin rays. *Ahliesaurus berryi*
- 3b. No series of internal melanophores, anal unpigmented, a series of enlarged melanophores along base of caudal fin rays *Scopelosaurus smithii*
- 4a. Pigment restricted to caudal fin or fin fold, larvae less than 15 mmSL with pigment usually more or less regular series bordering the whole caudal fin fold..... (*Scopelosaurus argenteus* & *S. lepidus*)
- 4b. Melanophores present on or near tip of caudal peduncle 5
- 5a. A mediodorsal and/or a medioventral series of melanophores on caudal peduncle, in larvae less than about 20mmSL on base of larval fin fold, in larger larvae imbedded between muscles of the tail. A series of internal melanophores at base of caudal fin..... *Scopelosaurus lepidus*
- 5b. No mediodorsal of medioventral series of melanophores 6
- 6a. Two short longitudinal series of dermal melanophores respectively just above and below the midline of the caudal peduncle. Under the posterior end of these a transverse band of internal melanophores *Scopelosaurus maui*
- 6b. Pigment pattern different with no melanophores at base of caudal fin, 1-3 melanophores on posterior part of caudal peduncle, no melanophores at base of caudal fin. *Scopelosaurus argenteus*

MERISTICS

Vertebrae:	
Prepelvic	17.5-18.5
Pelvic to Anal Fin	15-17
Anal to Caudal Fin:	13.5-15.5
Total	47-50
Dorsal Fin Rays	10-11
Anal Fin Rays	19-21
Pectoral Fin Rays	10-11(12)
Gill Rakers:	1+1+13-15
adults - atrophied, pigment spots	
Lateral Line Scales:	45-50

LIFE HISTORY

Range: Throughout area
 Habitat: Oceanic, larvae epipelagic, adults >500m
 ELH Pattern: Oviparous; hermaphroditic

LITERATURE

Bertelsen et al. 1976

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown

LARVAE:

Sequence of Fin Development: pectoral, caudal, adipose, anal, dorsal and pelvics

Length when dorsal and pelvic fins appear: >20mmSL

Body depth at dorsal: about 6%SL

Preanus length: 57-60%SL

Pigmentation: single longitudinal series of 6 large internal melanophores in the median plane of the body under the vertebral column, broad band of many dermal melanophores on caudal peduncle well behind adipose onto procurent caudal rays and base of caudal fin.

Melanophores on adipose and caudal fins.

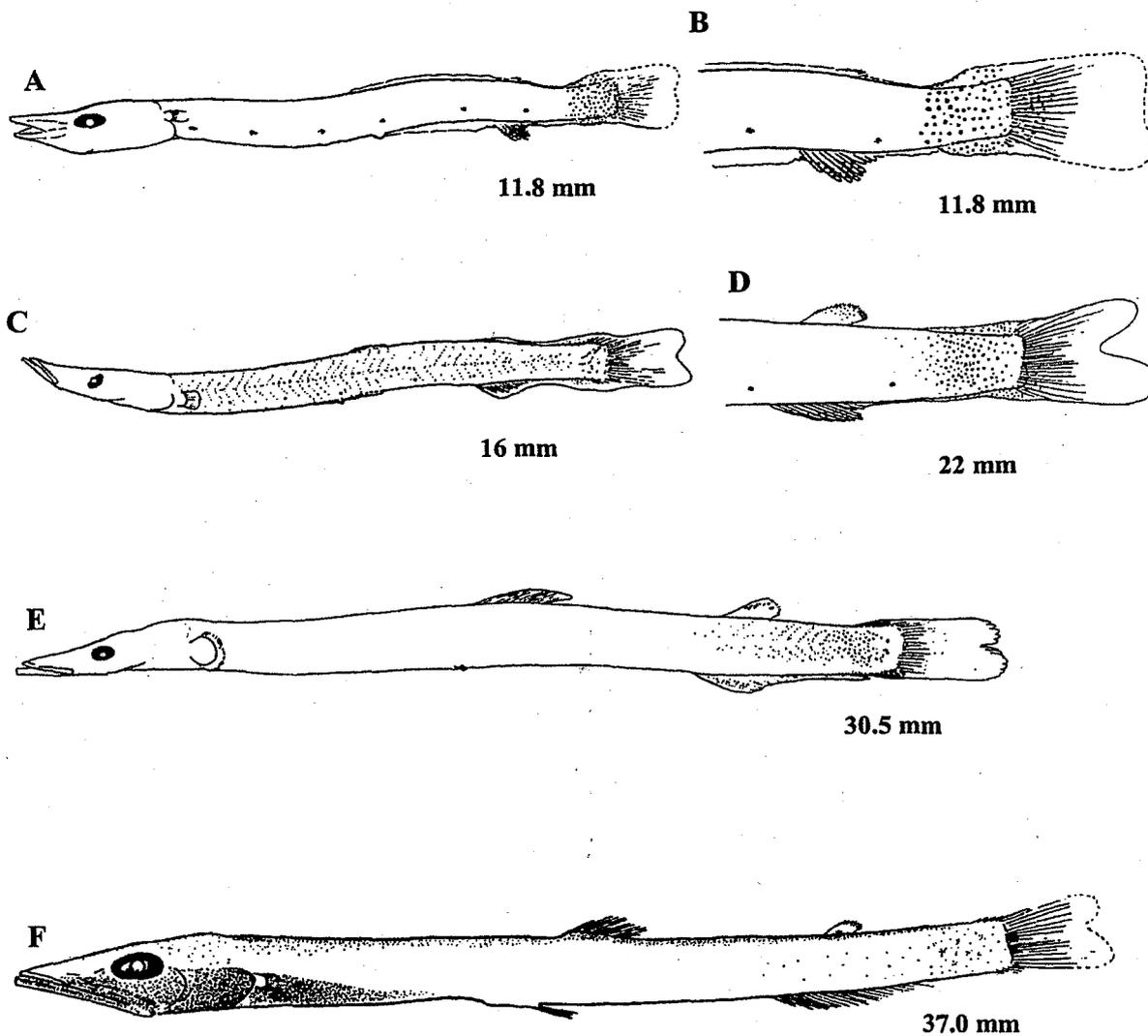
Diagnostic Characters: pigmentation

EARLY JUVENILES:

Diagnostic Characters: Meristics and pigmentation.

ILLUSTRATIONS

From Bertelsen et al. 1976 Fig. 15 a-f



NOTOSUDIDAE

Scopelosaurus argenteus

MERISTICS

Vertebrae:	
Prepelvic	14-17.5
Pelvic to Anal Fin	21-23
Anal to Caudal Fin:	17-18
Pelvic to Dorsal Fin:	4-5
Total	54-57
Dorsal Fin Rays	12-13
Anal Fin Rays	17-18
Pectoral Fin Rays	12-14
Gill Rakers:	1+1+13-16
adults - atrophied, pigment spots	
Lateral Line Scales:	57-58

LIFE HISTORY

Range: Throughout area
Habitat: Oceanic, larvae epipelagic,
juveniles 100-600m,
ELH Pattern: Oviparous; hermaphroditic

LITERATURE

Bertelsen et al. 1976

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown

LARVAE:

Sequence of Fin Development: pectoral, caudal,
adipose, anal, dorsal and pelvics

Length when dorsal and pelvic fins appear: >25mmSL

Body depth at dorsal: about 6%SL

Preanus length: 40-45%SL

Pigmentation: larvae <10mm with pigment in fin fold,
10-14mm unpigmented, 15-19mm rarely with spot
on caudal peduncle, 20-24 mostly unpigmented,
few with spot, 25-29 most with spot, fewer
unpigmented, 30-34 with spot. Spot may be absent
on one side or multiple.

Transformation: 28mmSL

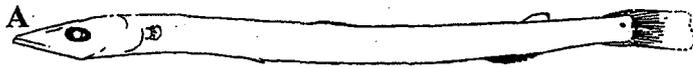
Diagnostic Characters: pigmentation

EARLY JUVENILES:

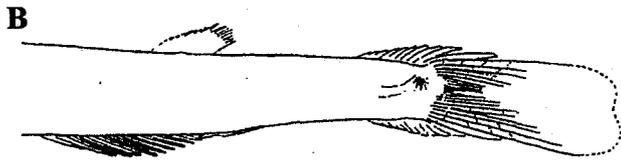
Diagnostic Characters: differ from *S. smithii* and *A. berryi* in lacking band of small melanophores on caudal peduncle; from *S. maui* by lacking enlarged series above and below notochord; <14mm cannot separate from *S. lepidus*.

ILLUSTRATIONS

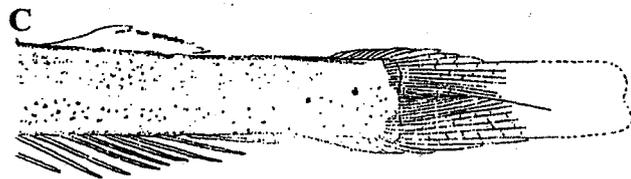
From Bertelsen et al. 1976 Fig. 32 a-c



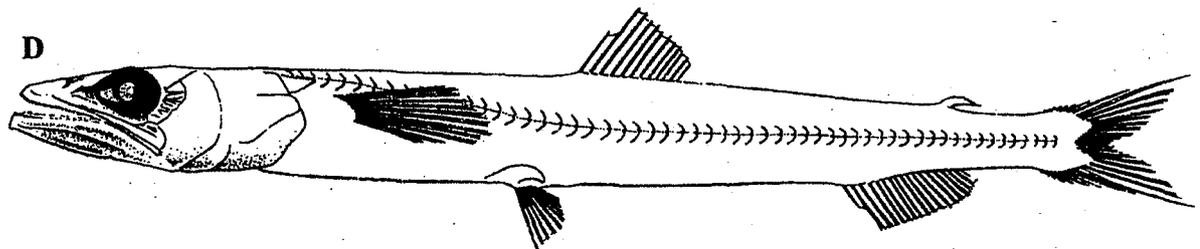
28.2 mm



28.2 mm



44 mm



161.5 mm

MERISTICS

Vertebrae:	
Prepelvic	17.5-21
Pelvic to Anal Fin	(20)21-23(25)
Anal to Caudal Fin:	17-21
Pelvic to Dorsal Fin:	4-5
Total	(58)59-61
Dorsal Fin Rays	(10)11-12
Anal Fin Rays	(16)17-19
Pectoral Fin Rays	13-15
Gill Rakers:	1+1+17-18
adults - atrophied, pigment spots	
Lateral Line Scales:	59

LIFE HISTORY

Range: Thought to spawn in Sargasso Sea just east of our area.

Habitat: Oceanic, larvae epipelagic, 70-100m

Juveniles 70-200m

ELH Pattern: Adults 500-800m

LITERATURE

Bertelsen et al. 1976

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown

LARVAE:

Sequence of Fin Development: pectoral, caudal, adipose, anal, dorsal and pelvics

Length when dorsal and pelvic fins appear: >22-24mmSL

Body depth at dorsal: about 5-5.5%SL

Preanus length: 40-44%SL

Pigmentation: mediodorsal and medioventral series of internal melanophores. Also, larger larvae lack dermal pigment on caudal peduncle (except for 1 or 2 small just outside internal series at base principal caudal rays).

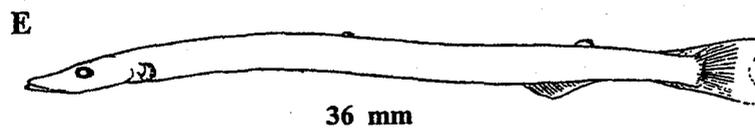
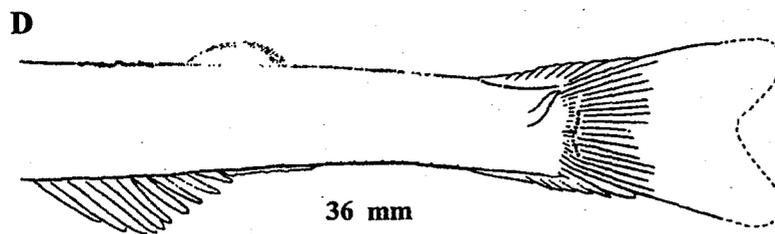
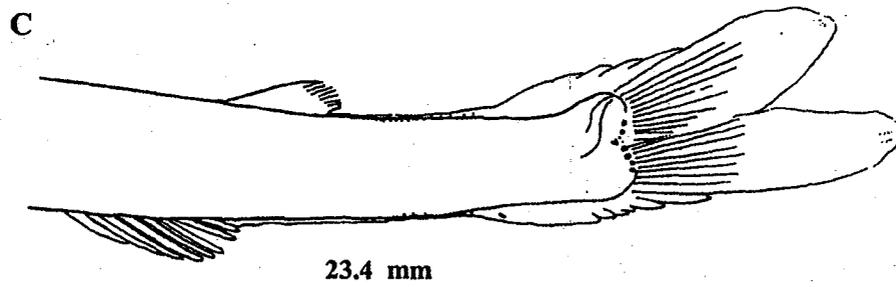
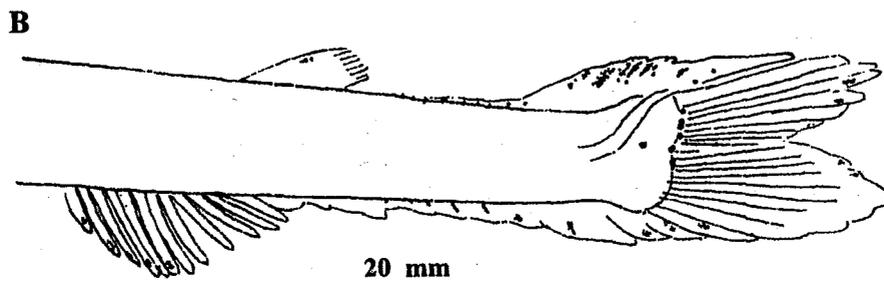
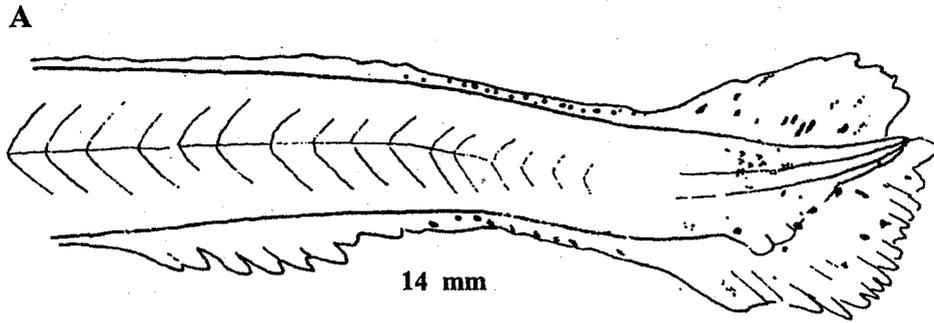
Diagnostic Characters: pigmentation but small larvae very close to *S. argenteus*

EARLY JUVENILES:

Diagnostic Characters: Meristics and increased pigmentation.

ILLUSTRATIONS

From Bertelsen et al. 1976 Fig. 51 a-e



MERISTICS

Vertebrae:	
Prepelvic	14-15.5
Pelvic to Anal Fin	22-23.5
Anal to Caudal Fin:	17.5-19
Pelvic to Dorsal Fin:	6-7.5
Total	55-57
Dorsal Fin Rays	10-11
Anal Fin Rays	17-20
Pectoral Fin Rays	12-13
Gill Rakers:	1+1+18-20
adults - atrophied, pigment spots	
Lateral Line Scales:	

LIFE HISTORY

Range: Throughout area
 Habitat: Oceanic, larvae epipelagic, adults unknown
 ELH Pattern: Oviparous; hermaphroditic

LITERATURE

Bertelsen et al. 1976

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown

LARVAE:

Sequence of Fin Development: pectoral, caudal, adipose, anal, dorsal and pelvics

Length when dorsal and pelvic fins appear: >22-24mmSL

Body depth at dorsal: about 6-7%SL

Preanus length: 38-40%SL

Pigmentation: caudal peduncle pigment unique - 2 longitudinal short series of large dermal melanophores and transverse band of internal melanophores in front of hypural bones.

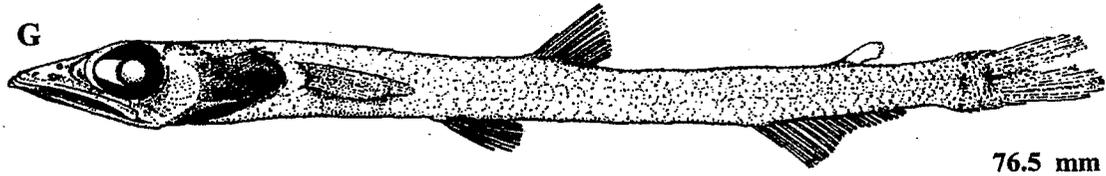
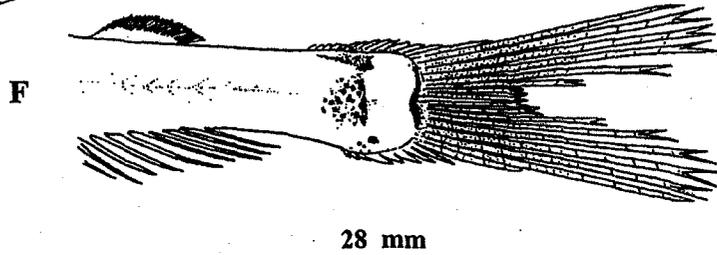
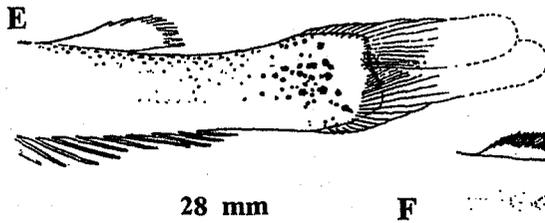
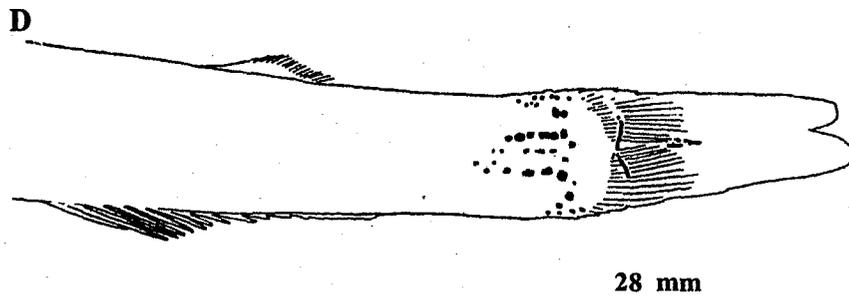
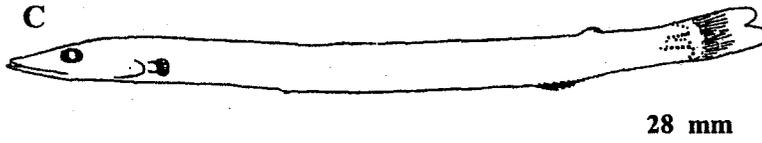
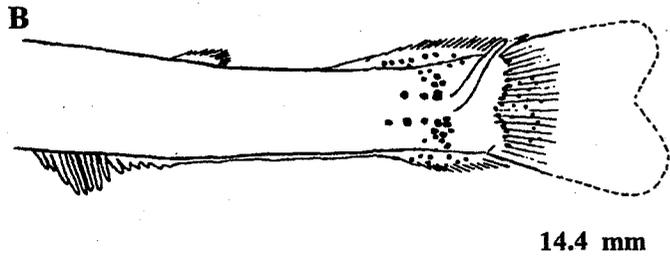
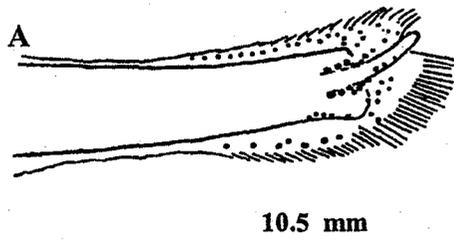
Diagnostic Characters: pigmentation

EARLY JUVENILES:

Diagnostic Characters: remains of unique pigment pattern.

ILLUSTRATIONS

From Bertelsen et al. 1976 Fig. 39 a-d



MERISTICS

Vertebrae:	
Prepelvic	16-19
Pelvic to Anal Fin	19-23.5
Anal to Caudal Fin:	15-19
Pelvic to Dorsal Fin:	3-5.5
Total	53-56
Dorsal Fin Rays	10-12
Anal Fin Rays	17-19
Pectoral Fin Rays	11-14(15)
Gill Rakers:	1(2)+1+12-16
adults - atrophied, pigment spots	
Lateral Line Scales:	54-57

LIFE HISTORY

Range: Throughout area
Habitat: Oceanic, larvae epipelagic, juveniles 50-200m,
adults >200m
ELH Pattern: Oviparous; hermaphroditic

LITERATURE

Bertelsen et al. 1976

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown

LARVAE:

Sequence of Fin Development: pectoral, caudal,
adipose, anal, dorsal and pelvics

Length when dorsal and pelvic fins appear: >20-
25mmSL

Body depth at dorsal: about 6-7%SL

Preanus length: 43-45%SL

Pigmentation: caudal peduncle band with numerous
small melanophores from just behind adipose to
front of caudal fin bases. Weak narrow caudal base
band. Characteristic spot on caudal fin of a group
of melanophores on median rays 1/4 of their
lengths behind caudal fin base. Pattern changes
with growth as spot becomes more distinct.

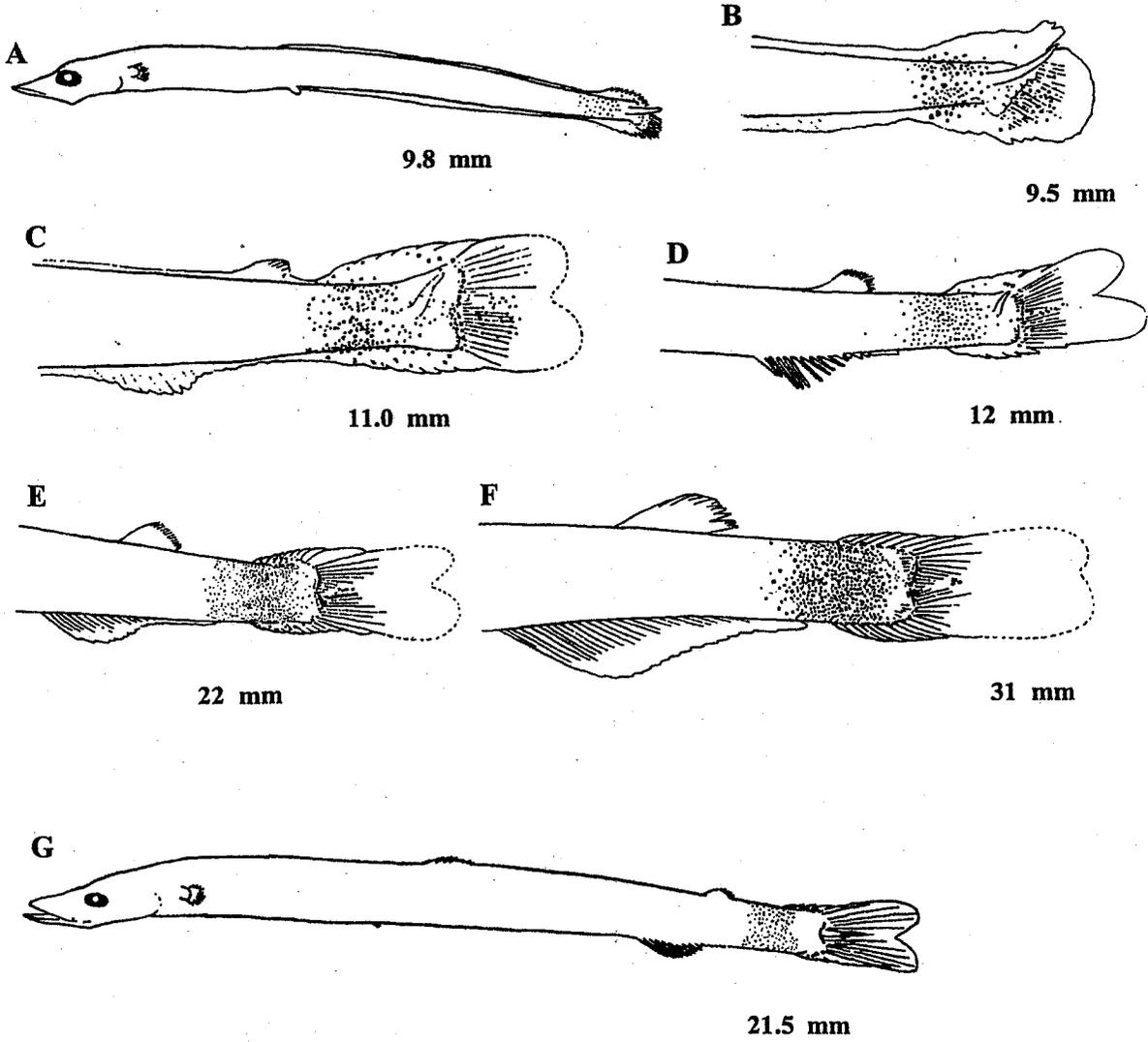
Diagnostic Characters: pigmentation

EARLY JUVENILES:

Diagnostic Characters: Meristics and pigmentation.

ILLUSTRATIONS

From Bertelsen et al. 1976 Fig. 29 f-i



Literature Cited

Bertelsen, E., G. Krefft, & N. B. Marshall. 1976. The fishes of the family Notosudidae. Dana-Rep. Carlsberg Foundation. 86: 114 p.

Watson, W. & E. M. Sandknop. 1996. Notosudidae. Pages 344-347 in The early stages of fishes in the California Current Region. H. G. Moser (ed.). Calif. Coop. Oceanic Fish. Invest. Atlas (33): 1505 p.